



**External Clearing for the PJM FTR Market
Clearing Overview and
Analysis of the Nodal Clear Proposition**

September 2019

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GLOSSARY OF TERMS

Appendix A contains definitions for all terms used in this document.

1 AN EXTERNAL CLEARING ALTERNATIVE

Clearing represents the ‘gold standard’ for the management of counter-party credit risk in the global derivatives markets. Over the past century, clearing houses have evolved to the point where they have joined exchanges as part of the integral infrastructure of the world’s financial markets. This was underlined by the importance of clearing in preserving stability, and supporting continued trading, during the energy merchant credit crisis of 2001-2003, and subsequently the events of the Global Financial Crisis (GFC) – which led directly to the countries of the G20 issuing a ‘clearing mandate’ requiring that, wherever possible, standardized trades be cleared¹.

For PJM, which historically does not have a strong record with credit risk management, particularly as it relates to the FTR market, outsourcing this function to an established clearing house, which would take the associated risk into its existing clearing structures, offers an alternative worthy of consideration. Clearing can also be a tough discipline, however. Clearing houses utilize a robust set of structures and processes to preserve the integrity of the trades they clear, including:

- Credit intermediation by strong financial players (often money-market banks)
- Rigorous participation requirements
- Initial margining of positions on a portfolio basis to a very high statistical likelihood
- Variation margining to incrementally settle gains/losses
- Swift liquidation of defaulting portfolios
- A robust system of protections beyond collateral

This paper outlines the disciplines of clearing in greater detail. It further examines specific challenges and considerations in applying the clearing model to FTRs, which have a number of unique characteristics. The broad conclusion is that clearing can be successfully applied to FTRs, but is not without its complexities, and would require some adaptation, by both PJM and participants, particularly those not presently engaged in futures trading.

Equally important in this consideration is finding an entity that is capable and interested in taking on the task. While no doubt keen for PJM’s business, a prudent clearing house will wish to ensure that its existing business is not put at undue risk, and will have a threshold for the amount of residual risk it is willing to take into its clearing structure, versus the revenue opportunity it, and its clearing members, see from taking on the risk.

In considering viable candidates, this analysis started from the baseline position that the clearing house must be a CFTC-authorized Derivatives Clearing Organization (DCO). Of these, four list electricity contracts for trading in North America, and only two have any material level of trading or open interest. Both were approached, and one – Nodal Exchange and its clearing affiliate Nodal Clear – elected to make a proposal, which has been provided to stakeholders directly by Nodal under separate cover.

PJM has examined the Nodal proposal, which we believe addresses the various considerations raised in Section 2. Some elements of this solution are straight-forward; others quite novel. Section 4 examines preliminary challenges that were perceived with these novel elements, and how these have been addressed. PJM believes Nodal Exchange’s proposal is worthy of serious consideration by stakeholders.

¹ A requirement subsequently enshrined in national legislation, including the Dodd-Frank Act in the US.

2 APPLICATION OF DERIVATIVES CLEARING TO FTRS

This section discusses the typical disciplines applied by a clearing house, and specific considerations in the application of these disciplines to PJM's FTR market.

2.1 Clearing House as Central Counter-Party

Clearing houses act as the central counter-party (CCP) – the buyer to all sellers and seller to all buyers – for trading in the markets they clear. In order for an External Clearing House (ECH) – which in this context is taken to mean a CFTC-regulated Derivatives Clearing Organization (DCO) – to take on PJM FTR positions, PJM's FTR CCP² would novate these positions to the ECH, which would then be substituted as the CCP for those positions.

Conceptually, external clearing could take place on a mandatory basis – i.e., all FTR trade would be cleared, immediately upon execution – or on a voluntary basis – i.e., only those who elect to clear would have their trades novated, with the residual remaining in the PJM FTR CCP.

Specific considerations include:

Exposure to CFTC regulation

All activity cleared by a DCO is subject to CFTC regulation. This may lead to a concern that clearing FTRs would open up another regulatory nexus for FTR market participants, with additional requirements for those trading and clearing. The counter-points to this argument are that:

1. FTRs are already subject to CFTC regulation, though with some exemptions granted.
2. Participants who are also trading in the futures market – as many do – are already subject to CFTC regulation for this activity, and thus face little to no additional regulatory burden.

Isolation of FTR risk from other PJM markets

Under the clearing model, the credit risk of all novated positions are transferred to the clearing house. Any default on those positions is isolated to, and managed by, the risk structures of the clearing house and does not impact on those trading only in other markets.

2.2 Credit Intermediaries

Clearing houses typically utilize financial intermediaries known as Clearing Members (CMs) – or in the US, Futures Commission Merchants (FCMs). Under this structure, Clearing Members are responsible to the clearing house for financial performance, with participants, in turn, responsible to their CM (see Figure 1). This intermediated structure is utilized by all DCOs involved in the clearing of energy contracts in the US.

The intermediated clearing model provides an additional layer of credit protection between the participant and the clearing house, reducing the risk of both. It is also deliberately structured to diversify the risk placed under its care, so that risk is not just transferred, it is reduced. The model can also serve to promote competition for various services, and encourage flexibility in meeting individual participant needs.

² See PJM, *Position Paper: FTR Central Counter-Party*, May 2019 (PJM1).

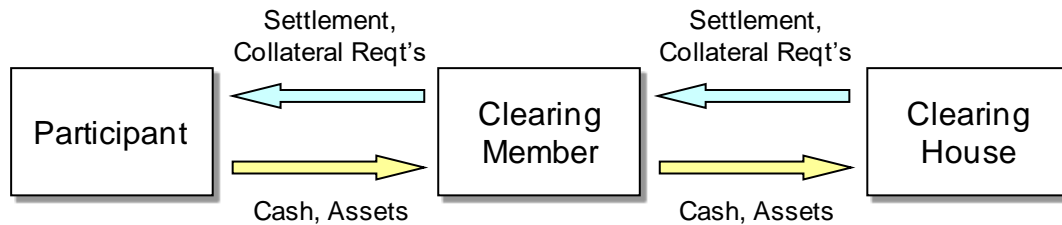


Figure 1 – Intermediated Clearing Structure

In the case of the FTR market, participants would need to establish clearing relationships with one or more FCMs (or become an FCM itself). It may also be necessary for PJM, as Congestion Rent Holder (CRH)³ and therefore party to most FTR transactions, to establish an FCM relationship, though the unique nature of this function may preclude this need.

Specific considerations include:

FCM restrictions on trade

FCMs may choose to impose collateral requirements and limits on their customers' trade beyond those imposed by the clearing house (e.g., to avoid the FCM having too much exposure to a single party), which may prove restrictive to some participants. These problem should be ameliorated, at least in part, by competition amongst FCMs, as well as the ability of a participant to have multiple FCM relationships

FCM refusal of some participants

It is possible that some existing FTR market participants may not prove acceptable to any FCM and thus be unable to secure an FCM relationship. The two principal solutions to this problem would be:

1. to make clearing voluntary, with the participant not clearing, or;
2. for the participant to fulfil its locational hedging needs through bilateral arrangements with entities that are able to trade and clear in the FTR market.

2.3 Participation

Clearing houses impose relatively strict requirements on their clearing members, related to capital adequacy, liquidity, etc.. They typically do not impose any requirements directly on market participants who are not clearing members, but require that the FCMs do.

Many of the futures markets associated with these clearing houses also require traders to undertake training and satisfy defined qualification criteria, but these are provisions of the exchange (as opposed to the clearing house), which would not automatically apply to PJM, though the clearing house may require PJM to put similar provisions in place. In order to manage its risk, an FCM may also require its customers to display a certain wherewithal to participate in the market, and satisfy probity checks.

In order to ensure that the clearing of the FTR market receives favorable regulatory treatment under the Commodities Exchanges Act (CEA), it may also be necessary for participants to be qualified as Eligible Commercial Participants (ECPs), or to receive a no-action letter from the CFTC waiving this requirement, or stating that they consider this requirement satisfied.

³ PJM1, op.cit.

It is conceivable that such provisions may preclude some current FTR market participants from participation in a cleared market. This could be particularly problematic in the case of physical participants with bona fide hedging needs. Alternative options for serving these customers could include clearing being offered on a voluntary basis (which would bring its own complications), or ineligible participants making their own, off-market bilateral arrangements for basis hedging (and not impacting their assignment of ARRs, where applicable).

Specific considerations include:

Prohibitions on derivatives trading

Some PJM participants argue that, due to their legal status or charter, they are prohibited from trading in derivatives, and that clearing their FTR positions would violate this proscription. One way to avoid this issue would be through use of a voluntary model for clearing, in which those participants leave their positions at the PJM FTR CCP.

It could also be strongly argued, though, that FTRs already are derivatives (the CFTC's exemption order⁴ exempts FTRs from certain provisions of the Commodity Exchange Act, but does not cede jurisdiction), just not as well protected from credit risk under the current arrangements. Thus, if the participant is already trading FTRs, it would suggest that any restriction on derivatives has already been overcome, or is being improperly ignored and exemption should be sought.

2.4 Initial Margin and Collateral

Clearing Houses operate on the principle of 'full collateralization', requiring collateral to be posted to cover a participant's potential future exposure to a high degree of statistical confidence. This is referred to as "initial margin", and is typically set to cover the $x\%$ worst exposure over an r -day risk period. Unsecured credit is not accepted.

The $x\%$ confidence level is typically defined at a level equal to, or better than, international standards. The Bank for International Settlements (BIS) and the International Organization of Securities Commissions (IOSCO) recommend that "initial margin should meet an established single-tailed confidence level of at least 99 percent of the estimated distribution of future exposure."⁵ It is standard clearing house practice for this risk to be considered on a 'portfolio margining' basis, in which the risk correlation between products is considered to determine margin for the portfolio as a whole. This provides a more capital efficient solution than margining each product on a stand-alone basis, while maintaining robust margining within defined confidence levels.

The risk period represents the period between when a participant's position is incurred or last marked-to-market and when it could be liquidated or achieve final settlement. For liquid derivatives products that trade on a daily basis (e.g. Henry Hub natural gas), the risk period is typically one day. For less liquid products, or those with longer billing periods, payment lags, trading frequency or time to liquidate, it will be longer. The length of this 'margin period of risk' will be an extremely important consideration for any clearing house which might offer clearing of the FTR market, as the longer the period, the greater the risk exposure – impacting not just the

⁴ Final Order in Response to a Petition From Certain Independent System Operators and Regional Transmission Organizations To Exempt Specified Transactions Authorized by a Tariff or Protocol Approved by the Federal Energy Regulatory Commission or the Public Utility Commission of Texas From Certain Provisions of the Commodity Exchange Act Pursuant to the Authority Provided in the Act, 78 FR 19880 (April 2, 2013).

⁵ BIS-IOSCO, *Principles for financial market infrastructures*, April 2012, section 3.4.18.

collateral required to be posted (and thus attractiveness of the service offering), but also the residual risk (outside x% confidence) which must be taken into the clearing house guarantee structure.

Clearing houses will typically seek to re-evaluate initial margin requirements as frequently as relevant new information becomes available – often on a daily basis, and in some cases intra-day. For the daily process, collateral requirements are typically calculated overnight, and any additional collateral required must be posted by a specified time in the morning. Failure to post will trigger default proceedings, including seizure of collateral and liquidation of positions.

Particular features/complications of the FTR market which will need to be considered as part of any external clearing option for FTRs include:

Contract equivalence and netting An FTR is a basis swap between two locations. Provided the clearing house lists the FTR product – or its underlying ‘legs’ – for trading on its affiliated exchange, participants should be able to offset their FTR and futures trades into a net position in the related contracts. This potentially offers significant collateral benefits.

Portfolio margining of positions impacts by common constraints Part of the nature of FTRs is that positions with different source/sink pairs may nevertheless have some risk correlation due to being impacted by the same network constraint(s). An initial margin model that considers only the source/sink location and not the underlying constraints may ignore such correlation and collateralize too conservatively from both a portfolio margining and liquidity risk perspective⁶.

At the same time, we are not aware of any ISO market that presently treats such margin calculations in an optimal manner.

Portfolio margining with non-PJM trades Portfolio margining (also known as cross-margining) allows the risk correlation between related products to be considered, assuming the clearing house has a material standing in those markets. This would allow cross-margining of FTR positions against positions in non-PJM electricity contracts, or underlying fuel contracts, such as natural gas.

Sensitivity to stochastic events FTR prices can be highly sensitive to stochastic events, such as changes in network topology. Modelling such events is not a classic clearing house skill. It will be important to understand the extent to which the clearing house would intend to consider such events in its initial margining model, and any particular data or processing requirements they would have of PJM to support the process. e.g., if forward-looking LMP simulations are a desirable part of the model, would the clearing house need PJM to carry these out?

⁶ The representation of the network within the FTR auction provides an implicit transfer function, that allows for reconfiguration of paths. For a path to be sold it does not require a buyer for the exact same path, but does require a buyer interested in the constraint alleviation the sale of the original path generates.

2.5 Forms of Collateral

Clearing houses require collateral in the form of liquid, redeemable instruments – cash, or instruments efficiently redeemable for cash, such as treasury instruments and letters of credit (LCs). This is consistent with the BIS-IOSCO Principles for Financial Market Infrastructures recommendation (Principle 5) that the collateral accepted by a CCP should have “low credit, liquidity, and market risks.”⁷

Principle 5 also recommends that financial market infrastructure providers should “set and enforce appropriately conservative haircuts and concentration limits.” Clearing houses typically limit the percentage of assets that may be deposited in the form of LCs, as well as setting concentration limits on the quantity of LCs that can be written by any one provider. Instruments other than cash are generally subject to a ‘haircut’ discount to their face value, to represent potential loss of value if the instrument needs to be promptly liquidated.

2.6 Liquidation Rights

It is standard practice in organized derivatives markets to liquidate the outstanding positions of participants in the event default. FCMs are required to have the authority to liquidate a customer’s positions in the event of default, and the clearing house will similarly have authority to liquidate the positions of a defaulting FCM. The right to liquidate the positions of a defaulting participant limits the ‘margin period of risk’, and thus the collateral that needs to be held as protection. However, FTR auctions are held infrequently, and large positions may take multiple auctions to liquidate.

Specific considerations of clearing FTRs through an external clearing house include:

<i>Liquidation through related exchange</i>	If the affiliated exchange of the clearing house lists the FTR product, or its ‘legs’, this provides significantly more frequent – presumably daily – opportunity for liquidation, reducing the MPOR, and hence initial margin requirement.
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2.7 Variation Margining

The settlement of derivatives markets is typically carried out by clearing houses on an incremental basis, through the ‘variation margining’ process – also known as ‘mark-to-market’. Variation margining ensures that gains and losses are crystalized on an ongoing basis, limiting the ‘margin period of risk’ (MPOR) that must be covered by initial margin – and thus limiting initial margin requirements. The frequency with which the settlement process is carried out (i.e. the billing period) depends on the particulars of the market, though for many cleared markets this takes place on a daily (T+1) basis, and sometimes intra-day. The time from calculation of settlement obligation to payment being required is typically only a matter of hours.

For the FTR market, the obvious opportunity for mark-to-market of positions is following execution of each FTR auction. However, FTR auctions take place relatively infrequently (monthly for balance of the planning period, and proposed five times annually for later years).

Specific considerations associated with external clearing include:

<i>More frequent variation margining</i>	Provided the clearing house lists the FTR product – or its underlying ‘legs’ – for trading on its own exchange, it should be in a position to
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⁷ BIS-IOSCO, op.cit., p46 (Principle 5).

determine settlement prices and perform 'mark-to-market' on a far more frequent basis than the frequency of PJM's FTR auctions. This would substantially reduce the MPOR to be covered by initial margin.

Shorter settlement timeframes

The corollary to more frequent margining is that settlement of variation margin and posting of collateral would be forced to an accelerated timeframe – generally each business day, and potentially more frequent.

These timeframes should not be problematic for participants who already trade futures, but may prove difficult for less sophisticated participants. However, the latter can be remedied, at least in part, by the participant keeping additional margin on deposit with their FCM in order to avoid daily posting.

Equally important to clearing of the FTR markets will be bridging the cashflow gap. As discussed in PJM's paper on Variation Margin and Post-Auction Settlement⁸, PJM as Congestion Rent Holder (CRH) sits on one side (usually a seller) of almost all FTR transactions. The value of the FTR portfolio held by the PJM CRH might fluctuate up or down over time. However, the PJM CRH does not have the day-ahead market (DAM) congestion rents, which underwrite the FTRs, available to it until the DAM settles. While the PJM CRH will always be made whole in the long-run⁹, under a variation margining regime this creates a cashflow timing issue, where the PJM CRH might need to pay-out on FTR positions, but does not yet have the supporting DAM cashflow available to it.

Variation margin financing needs

In an environment entirely controlled by PJM, available options to manage this cashflow problem are not to pay out cash beyond the participant being net break-even (across all accumulated variation margin on open positions), or to handle variation margin as collateral rather than cash (as PJM currently does).

Under the formal processes of a regulated DCO, these options will be unacceptable. The alternative, per the recommendations of Market Reform's 2008 report, is that: "an imbalance account, held by PJM, will be required to manage overs/unders until the FTR is delivered in the DAM."¹⁰ Given PJM does not maintain large quantities of reserve cash on-hand to cover the 'unders', this account would need to be supported by appropriate financing.

2.8 Banking

Clearing houses typically maintain an extensive network of relationships with money-market banks, to facilitate the efficient daily and intra-day movement of funds. Settlement amounts must be paid by the FCM by a specified time each morning (10a.m. being typical), though some FCMs will give their customers a little longer (the daily close of the Fedwire system being

⁸ PJM, *Variation Margin and Post-Auction Settlement*, June 2019 (PJM2)

⁹ Even if FTRs end up 'under funded', PJM's rules prescribe a formula for addressing this, guaranteeing that PJM is kept whole.

¹⁰ Market Reform, *PJM Credit and Clearing Analysis Project: Findings and Recommendations*, June 2018

common)¹¹. Failure to pay results in default proceedings. One advantage of this approach is a single, standardized settlement across all markets cleared by the clearing house.

2.9 Trading/Bid Limits

Clearing houses generally require an exchange to impose some form of credit risk limit validation. In some markets these limits will be calculated based on free collateral (i.e. collateral posted and not otherwise used to cover existing exposures), the aim being to prevent any new exposure being incurred that would cause the exposure of the participant's net position to exceed their posted margin. Some other markets, rather than calculate such limits directly, allow the participant's FCM to specify risk limits on trading activity. In either case, PJM would need to make changes to its systems to validate against these limits, and implement appropriate interfaces to the clearing house (to obtain details of collateral holdings and exposures) or the FCMs (to allow entry of limits).

The nature of the limit will also need to be examined. From a collateral efficiency standpoint, the credit limit would ideally be imposed in the auction, so that the margin requirements for the awarded portfolio do not exceed collateral on-hand. Such constraints can be difficult to impose in optimization-based problems however.¹² Bid limits – in which collateral is levied on the assumption that all bids are cleared – are often used as a proxy (including under present PJM arrangements), at least until after the auction awards are finalized and final portfolio margin requirements can be calculated. Whether limits are imposed on bid submission, in the auction, or both, the clearing house and/or FCMs will require linkages into this process.

2.10 Trade Guarantee Structure

Clearing houses are required to have an extensive trade guarantee structure to protect the integrity of the clearing house in the event of default by a clearing member which is not able to be satisfied by the collateral on-hand (whether due to the event falling outside of the collateralization range, imperfections in the model used for initial margining, or other causes). These protections, sometimes referred to as a 'guarantee pyramid' or 'default waterfall', often include:

- A guarantee fund (also known as 'default fund' or 'reserve fund') contributed to by all FCMs. The defaulting FCM's contribution is consumed first, followed by those of the other FCMs on a pro-rata basis.
- Default insurance, as an intermediate layer of protection, not primary defense.
- Clearing house profits and/or capital, in instances where the clearing house is a for-profit entity with profits/capital to put at risk
- Socialization of the default to the FCMs, generally through an assessment capped on a 'per FCM, per default' basis. This is typically the last line of defense.

Should socialization fail, the clearing house would typically move into established processes for short-payment of obligations and orderly business wind up.

¹¹ FCMs cannot generally allow longer for customer payment, as this crosses the line from cashflow management to margin lending, which FCMs are not allowed to engage in (though their banking affiliates may).

¹² This occurs because the credit constraint, which forms an input to the auction solution, is impacted by prices and quantities awarded, which are outcomes of the solution. This can sometimes be resolved through 'successive iteration', but that in-turn carries performance and other potential challenges.

*Protections beyond
socialization*

These protections represent a significant improvement upon PJM's current practice, which has been to socialize to participants any default amount not covered by collateral – charges which are unpredictable and unhedgeable.

2.11 Financial and Market Surveillance

Clearing houses typically conduct extensive financial and market surveillance.

- *Financial Surveillance:* Monitors the financial integrity of clearing members and customers, in order to ensure the integrity of the Clearing House. Functions performed include periodic audits of clearing members, review of margin call submissions, etc.
- *Market Surveillance:* Normally conducted in conjunction with the exchange being cleared, market surveillance ensures that the markets are operating in an orderly fashion, and free from distortion or manipulation. Functions performed include ensuring the convergence of cash markets with forward markets, monitoring of large trader positions, and establishment and enforcement of position limits and position accountability levels.

In addition, it would be expected that the exchange being cleared is conducting appropriate *trade surveillance* procedures.

In order to support the clearing house's surveillance functions, PJM would need to work with the clearing house to define the required data and establish mechanism for its provision. It would also need to establish processes for enforcement of position limits and accountability levels, though full systems-based automation may not be required (or even desirable).

3 EXTERNAL CLEARING OPTIONS

Four exchanges list electricity futures contracts for trading in the US:

- Intercontinental Exchange (ICE), which clears through its European clearing house, ICE Clear Europe
- Nodal Exchange (Nodal), which clears through its clearing subsidiary Nodal Clear
- CME (NYMEX), which clears through its own subsidiary CME Clearing
- Nasdaq Futures (NFX), which clears through the Options Clearing Corporation (OCC)

Of these, only two – ICE and Nodal Exchange – have any material trading or open interest in electricity contracts. LCH, which previously cleared trades on both ICE and Nodal, no longer clears any US electricity contracts. As such, ICE and Nodal are the only two viable alternatives to provide clearing services for PJM's FTR market.

Nodal has expressed active interest in clearing PJM's FTR market. ICE was approached concerning its interest in making a proposal, and declined. As such, there is only one interested party offering to provide this service.

For this reason, a competitive process has not been entered into. Instead, Nodal has been invited by PJM to detail its proposed approach, and commercial proposition, which is discussed in later sections of this paper. This envisages participants having a voluntary choice regarding whether to clear, with residual portfolios remaining with the PJM FTR CCP. Nodal was also invited to prepare a discussion of mandatory clearing, along with the regulatory and other complications they would envisage with such an approach, but declined.

The choice for PJM stakeholders will be whether to adopt external clearing as defined by Nodal's proposition (which will no doubt be refined through further discussion and negotiation), or by default, to leave responsibility for managing FTR credit risk, and building out the required capabilities, with PJM.

4 UNIQUE FEATURES AND CHALLENGES OF THE NODAL PROPOSAL

Nodal Exchange has provided a formal proposal to PJM to provide clearing for the FTR market¹³ through its clearing house subsidiary, Nodal Clear. This has been provided to stakeholders under separate cover, and is referred to throughout this section as the 'Nodal Proposal'.

Nodal proposes to apply classic clearing disciplines to the FTR market. In its proposal Nodal has discussed its proposed solutions to many of the specific challenges of clearing an FTR market, as outlined in Section 2 of this document. This Section 4 looks specifically at the novel features of the Nodal Proposal, preliminary challenges that PJM perceived and how these have been addressed.

Voluntary clearing

Nodal's solution proposes to undertake clearing on a voluntary basis. Only those who wish to clear would novate their positions to Nodal – made possible by PJM (as CRH) being on the other side (usually the seller) of every novated transaction. Those transactions that are not sent for clearing would remain at PJM, in a 'residual risk pool' managed by the PJM FTR CCP.

On the positive side, PJM would not need to mandate clearing, and those unable or unwilling to clear could leave their positions in situ. On the negative side, the residual risk pool is likely to be populated by counterparties of increasingly poor credit quality, as better qualified parties move to the clearing house, increasing the likelihood of default.

The voluntary model also requires PJM to continue to manage the residual risk pool, either by maintaining and enhancing its own capabilities (the presumption being that present capabilities are inadequate), or by contracting with others to provide operational services (i.e., to perform the processing, not take on the risk). Nodal has, as an adjunct to its principal proposal, offered to take on this processing function on a contract basis through its Nodal Data Services subsidiary. This would relieve the need for PJM to maintain these functions, which is likely to be more expensive.

The alternative to Nodal's proposed voluntary model is mandatory clearing, such as that which applies to regular futures trading (i.e., all trades must be cleared). This would potentially bring a different set of complications, including how to handle participants who are not accepted for clearing. It could also require PJM to become a CFTC-regulated Designated Contract Market (DCM).

Product coverage

Nodal proposes to break an FTR into its two constituent 'legs'¹⁴, which will each be cleared. This requires both the FTR source and sink to align with futures contracts listed by Nodal. Nodal already has good product alignment, listing all the key aggregate (hub, zone), interface

¹³ Nodal Exchange, *FTR Clearing (EFTRs) Proposal for PJM*, September 4, 2019.

¹⁴ From a futures market perspective, an FTR is equivalent to a 'spread', which is a position achieved through the simultaneous purchase of one contract and sale of another (related) contract – or vice versa.

and generation node points utilized by PJM FTRs. However, Nodal does not list load nodes, and does not propose to do so.

PJM presently makes all load nodes available for FTR trading in the prompt month only. By exception (15-20 cases), PJM also makes certain load nodes available for trading in the annual auction (and hence tied to ARRs) for entities with DAM physical exposures at those nodes.

Assuming that Nodal maintains its position that it does not wish to list load node products, and PJM continues to make them available for FTR trading, participants trading in these products will not be able to clear that portion of their business, even if they clear all the rest.

Cross-margin offsets

An attractive part of Nodal's proposition is its ability to offer portfolio margining – essentially initial margin offsets between the positions in the participant's portfolio based on the risk correlation between them. The ability to offer such offsets, however, requires the clearing house to have material standing in those markets.

In the case of Nodal, it has such material standing across a wide range of nodal and aggregate locations traded at PJM. It also has solid presence in other electricity markets contiguous to PJM, which might offer risk correlation. While Nodal lists a Henry Hub natural gas contract, it does not presently have a material standing in the natural gas market.

Variation margin line-of-credit

As discussed in Section 2.7, proper cash-based variation margining – such as that performed by clearing houses – would require PJM (or more precisely, the CRH) to maintain an imbalance account “to manage overs/unders until the FTR is delivered in the DAM. Given the potential for large negative cash flows at times, and that PJM does not maintain large quantities of reserve cash on-hand, this account would need to be supported by an appropriately sized line-of-credit.

Initial estimates by Nodal indicate that the required size of this line-of-credit could be in the \$2-3 billion range, to ensure a very low probability of it being exceeded. The cost of this line (when drawn down) would need to be shared amongst those participants choosing to clear. Obtaining such a line-of-credit is also likely to prove non-trivial, with the risk likely to require syndication to multiple parties.

'Put-back' of positions

In PJM's assessment, the most problematic feature of Nodal's proposed model is the stipulation that, in the event of PJM's line-of-credit being insufficient to meet a variation margin call, rather than PJM suffering a default, the position would be unwound at Nodal through the Exchange of Futures for Related Product (EFRP) mechanism, and re-established at the PJM FTR CCP. This has a few concerning implications:

1. Participants who conducted other trading at Nodal and netted their position to zero – i.e., 'got out' – would find that they receive their position back at PJM, along with a countervailing

position on Nodal. This would mean they were never truly 'out' until FTR final settlement, partially diluting the claimed netting benefit.

2. It is also unclear how the above would be addressed where a participant had long since ceased to trade, but had exited their portfolio, and the PJM market, in good order.
3. PJM would need to maintain the capability to perform credit risk management on these portfolios should they be 'put back', which would likely occur at a time of severe market stress. This concern would be partially addressed by Nodal continuing to provide operational support through Nodal Data Services (though PJM would remain accountable for the risk, and collection and payment of monies)

While it is realized that the possibility of PJM exceeding its line-of-credit and these events coming into play is very low, it is the *raison d'être* of risk management to consider the improbable. It is also understood that there is some precedent for EFRP being used in this manner during events in the grain market in the 1970's. Nevertheless, needing to call upon this mechanism would represent an event of severe market dislocation. It is also highly likely that it would be occurring at a time of severe stress in the physical market (large scale price spikes, driven by events such as the Polar Vortex, are the type of event likely to put PJM's line-of-credit under stress).

If this mechanism is to be available – and our assessment is that it is inseparable from the broader Nodal proposition – then the processes to followed in the event it is triggered would need to be well understood and rehearsed in advance.

APPENDIX A – GLOSSARY OF TERMS

TERM	DEFINITION
CCP	Central Counter-Party. Legal entity that functions as the buyer to all sellers and seller to all buyers, typically for exchange trading. A clearing house acts as a central counter-party.
CFTC	Commodity Futures Trading Commission. Regulator for derivatives markets in the US.
CRH	Congestion Rent Holder. Name given, for the purposes of this analysis, to the PJM entity (conceptual or legal) that receives the stream of congestion rents from the DAM, and stands as the PJM party (not CCP) to each FTR transaction.
DAM	Day-Ahead Market. Market executed day-ahead for a series of time intervals (typically hours) comprising the following day.
DCM	Designated Contract Market. CFTC designation for an approved exchange or board of trade.
DCO	Designated Clearing Organization. CFTC designation for an approved clearing house
EFRP	Exchange of Futures for Related Product. A method used by futures exchange to convert off-exchange traded product into a futures position, or conversely, convert a futures position into a related off-exchange position. Exchange of Futures for Physical (EFP) and Exchange of Futures for Swaps (EFS) are subsets of EFRP.
FERC	Federal Energy Regulatory Commission. US energy market regulator.
FCM	Futures Commission Merchant. Also referred to as clearing member. An entity that transacts business at a clearing house, either as a financial intermediary for others, and/or for its own account.
FTR	Financial Transmission Right. A forward financial instrument which financially settles based on the price differential between defined source and sink locations.
ISO	Independent System Operator. Operates a region's electricity grid. Often also provides reliability planning for the region's bulk electricity system, and administers the region's wholesale electricity markets.

TERM	DEFINITION
PJM FTR CCP	PJM FTR Central Counterparty. The proposed stand-alone central counter-party for all FTR trades for which PJM remains the CCP.
RTM	Real-Time Market. Electricity market running proximate to the time of physical delivery, and typically integrated or coordinated with the dispatch process.
RTO	Regional Transmission Organization. FERC-authorized entity responsible transmission operations, transmission planning and market operations of the electricity grid for a defined multi-utility region.